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Development of a Baamboozle-Based Educational Game Test Instrument to Enhance Critical Thinking Skills in Elementary IPAS Learning

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ABSTRACT

The limitations of media in supporting learning and the lack of variation in the use of digital media in implementing learning. The purpose of this study was to determine the effect of using educational game-assisted media bamboozle in improving critical thinking skills. This research method is research and development (R&D) with the ADDIE model which includes analysis, design, development, implementation and evaluation. The results of the study stated that the use of bamboozle web media can significantly improve students' critical thinking skills with a significance value of the mann-whitney test of 0.028. Based on the basis of mann-whitney decision making which states that significance <0.05 then H0 is rejected and Ha is accepted. This means that there is a significant difference in the use of media that has been developed, namely bamboozle web media with powerpoint media.

Keywords:

Bamboozle;
Interactive learning media;
Critical thinking skills

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Introduction

The emergence of the Society 5.0 era marks a significant advancement in technological development, emphasizing the integration of technology into all aspects of life, including education. Education plays a crucial role in developing individuals' potential academically, non-academically, socially, and through practical skills to become intelligent, creative, and responsible citizens. According to the National Education System Law No. 20 of 2003, education is a conscious and structured effort to create learning environments that allow students to actively develop their potential, spiritual strength, self-control, personality, intelligence, noble character, and essential life skills for themselves and society. This is in line with the concept of the Merdeka Curriculum, which encourages enjoyable learning experiences where students are active participants rather than passive recipients of knowledge.

As education adapts to the dynamics of the 21st century, it must remain contemporary, technology-driven, and student-centered. The effectiveness of learning depends on multiple factors, including students, teachers, materials, methods, learning resources, media, and infrastructure. However, many teachers still

rely heavily on conventional media such as textbooks and blackboards, resulting in less engaging learning environments. In the digital era, educators are expected to utilize technology-based media to create interactive, enjoyable, and meaningful learning experiences.

In line with Ministry of Education Regulation No. 16 of 2022 on educational process standards, learning strategies should connect theory to real-life contexts, foster student engagement, and maximize the use of technology and available resources (Government Regulation of the Republic of Indonesia, 2022). Within the Merdeka Curriculum, the Science and Social Studies (IPAS) subject plays a key role, as it explores the relationship between humans and their environment through the study of natural and social phenomena. Therefore, appropriate and innovative learning media are needed to support teachers in effectively delivering IPAS materials.

One promising innovation is the integration of Baamboozle-based learning media, an interactive web-based educational game that enhances motivation and engagement. Educational games are designed to stimulate thinking, improve concentration, and develop problem-solving skills through enjoyable learning experiences (Handriyani, 2009) Baamboozle provides an interactive digital platform that allows teachers to conduct team-based quizzes, promote collaboration, and strengthen students' understanding through play.

Critical thinking is an essential higher-order skill in IPAS learning, enabling students to analyze problems, evaluate evidence, and make informed judgments. John Dewey (1859–1952) described critical thinking as active and reflective consideration of beliefs based on supporting evidence. Beyer (1995) outlined six characteristics of critical thinking, including skepticism, open-mindedness, respect for data, clarity, precision, and logical reasoning. Similarly, Sihotang, 2019) defined it as reflective thinking that guides judgment and decision-making. Critical thinking, therefore, not only enhances learning outcomes but also equips students with lifelong problem-solving abilities (Wallace & Jefferson, 2015 in Suciono, 2021). Observation and interviews revealed several challenges in classroom learning limited use of instructional media, ineffective assessment of students' critical thinking, often reduced to simple Q&A sessions, students' low engagement due to monotonous learning methods. To address these issues, this research focuses on developing Baamboozle-assisted test instruments to improve students' critical thinking skills in the IPAS subject for fifth-grade students at MI Darul Ma'arif 1 Serut. This innovation aims to provide teachers with an engaging, technology-integrated tool that enhances learning effectiveness, promotes collaboration, and supports students in developing critical thinking through enjoyable digital learning experiences.

Methods

The research method used in this study was Research and Development (R&D), following the ADDIE development model procedure. Borg and Gall (1998) stated that research and development is a process or method used to validate and develop a product. Meanwhile, Richey and Klein (2010) defined design and development research as a systematic study of how to design a product, develop or produce the design, and evaluate the performance of that product to obtain empirical data that can be used as the basis for creating tools, materials, and models applicable in both instructional and non-instructional settings (Sugiyono, 2022). The primary objective of this study was to produce a test instrument integrated with an educational game medium. According to Sugiyono (2015), research and development serve the dual purpose of validating and improving a product to ensure its effectiveness and applicability in real-world educational contexts. This study implemented the R&D approach using the ADDIE model, which consists of five stages: Analysis, Design, Development, Implementation, and Evaluation.

Results and Discussion

The analysis stage is carried out to identify the necessary elements in the research and to determine whether the product being developed can be used and is aligned with the learning materials taught at school. This stage consists of:

Analysis Stage

This stage involves analyzing the environmental situation and collecting information that can serve as material for developing the product.

Curriculum Analysis. The purpose of curriculum analysis is to consider the characteristics of the school curriculum (ADDIE model) and to identify learning materials that are relevant to the development being conducted. Curriculum analysis is carried out to align the teaching materials that will be developed. The curriculum used at *Madrasah Ibtidaiyah Darul Maarif 1 Serut* is the *Merdeka Curriculum* for all grades, namely grades I, II, IV, V, and VI. Learning Material Analysis. Learning material analysis is conducted by aligning the selected development with the curriculum. This analysis involves breaking down the learning outcomes and objectives into specific learning indicators. The selected subject is *IPAS* (Integrated Science and Social Studies) with the theme "My Proud Region" Topic A: "What Is My Regional Culture Like?" This material was chosen based on the level of difficulty students experience in understanding it. The wide range of contextual discussions in this topic is one of the reasons for its selection.

Learning Media Analysis. The purpose of learning media analysis is to determine the required tools and systems that support the development of the learning media. The learning media used in this research is an educational game using Bamboozle.

Design Stage

This stage aims to assist the researcher in designing the product to be developed. The design stage includes the preparation of teaching modules, tests, and learning media. The process begins with determining the material to be used for development. Development of the Teaching Module. In this stage, preparing the teaching module is the main priority. The module serves as a guide for teachers in implementing the learning process. It contains learning outcomes, objectives, and the flow of learning goals. Development of Test Instruments. The design of the test instruments begins with aligning the material with indicators of critical thinking. The selected indicators include observing, analyzing, answering questions, and making decisions. Bamboozle Web Learning Media. In designing the Bamboozle web-based learning media, questions are developed to be used during the learning activities.

Development Stage

This stage aims to determine the feasibility of the product by integrating all components that have been prepared into a final product. Once the product has been developed, the next step is product validation by expert validators. The stages of development are as follows is Developing Test Instruments. The test instruments are created based on the critical thinking indicators used in the study, which include observing, analyzing, answering questions, and making decisions. Developing the Learning Media Product Using the Bamboozle Web Platform.The learning media product is developed by aligning it with the constructed test instruments. Validation by Media Experts and Test Experts. The validation process is carried out by media and test experts.

The data from the validation results of the developed test instrument content are presented in Table 1 below.

Table 1. Results of the validity test of the test and materials

No.	Aspects assessed	Percentage (%)	Validity category
1.	Learning media	79,2 %	Suitable
2.	Test instrument	100 %	Very suitable

Source: Processed data, 2025

Based on Table 1, it can be seen that the results of the test and material validity indicate that both are feasible, with the learning media obtaining a percentage score of 79.2% and the test instrument obtaining 100%.

Product Trial. At this stage, the product trial was not conducted as a readability test with students, but rather as a field trial using a quasi-experimental method. The implementation stage was carried out after the product was declared valid and feasible based on the validation results from the media and test experts. Once the product was confirmed to be valid, validity and reliability tests were conducted. The validity and reliability tests aimed to ensure that the test items were of good quality and could accurately measure what they were intended to assess. The validity test focused on the alignment of the questions with the indicators and on identifying potential errors that could affect the results. After the validity and reliability tests confirmed that the instrument was valid and reliable, the next step was the implementation of the learning activities with fifth-grade students at MI Darul Maarif 1 Serut, involving 39 students, which took place from February 10 to February 13, 2025.

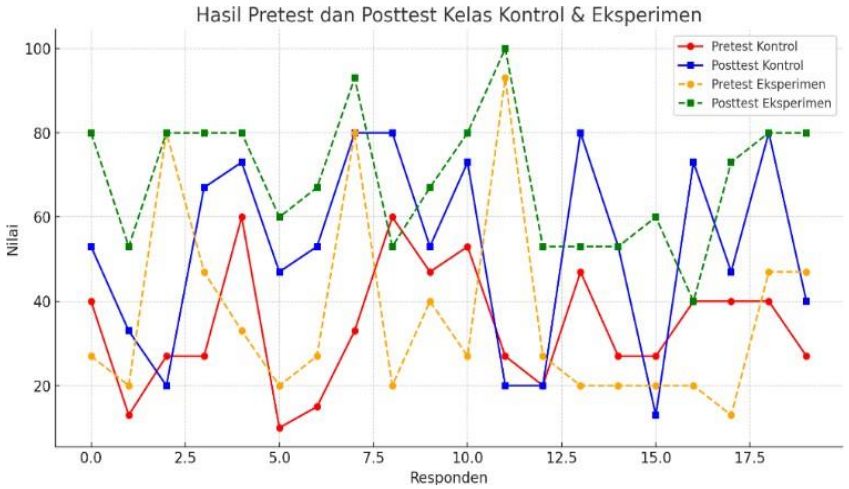

Figure 1. Graph of Pretest and Posttest Scores

Source: Processed data, 2025

This graph illustrates the changes in students' scores from the first to the third meeting in both the experimental and control classes. The vertical axis represents the score results, while the horizontal axis represents the respondents or students. In the control class graph, the pretest and posttest scores did not show a significant change.

Evaluation Stage

The evaluation stage is conducted to observe and measure the achievement of the test instrument assisted by the Bamboozle educational game in improving the critical thinking skills of fifth-grade students. The evaluation results aim to provide feedback on the development of the test instrument, the Bamboozle web-based learning media, and the teaching module that have been implemented in the learning process. The evaluation focuses on the alignment of the learning objectives, the relevance of the Bamboozle web-based learning media to the curriculum, and the interactivity that supports the learning process. Evaluation is carried out through assessments conducted by media experts and test experts.

Based on the results of the validation by the media and test experts, it can be concluded that the developed product is feasible for use, with revisions made according to the validators' suggestions. To determine the effect of using the developed media namely, the test instrument assisted by the Bamboozle web-based media pretests and posttests were administered to the students. The collected data were then analyzed through normality tests, homogeneity tests, and hypothesis testing using the Mann-Whitney test.

Normality Test

The normality test is a prerequisite test used to determine whether the data are suitable for analysis using parametric or non-parametric statistical methods (Hidayana & Apriani, 2023). The following presents the results of the normality test conducted in this study:

Table 2. Results of normality test

Class	Sig value.	Information
Experimental pretest	0,000	Abnormal
Experimental posttest	0,223	Normal
Control pretest	0,360	Normal
Control posttest	0,044	Abnormal

Source: Processed data, 2025

Normality Test

The normality test in this study employed the Shapiro–Wilk test, as the sample size was fewer than 50, specifically consisting of 39 samples. Based on the results of the normality test, it was found that the experimental pretest and control posttest data were not normally distributed, while the experimental posttest and control pretest data showed a normal distribution.

Homogeneity Test

The homogeneity test is used to determine whether the samples taken from the same population are uniform (homogeneous) (Sugiyono, 2022). The result of the homogeneity test obtained a significance value of 0.164, which indicates that the experimental class and the control class are homogeneous. This means that both classes have equal variance.

Since the results of the normality test showed that the data were not normally distributed, but the homogeneity test indicated homogeneous data, the Mann–Whitney test was used for hypothesis testing in this study.

Hypothesis Test

The Mann Whitney test serves as an alternative to the parametric two-sample t-test for small sample sizes [(Sugiyono, 2022)]. The results of the Mann–Whitney test yielded a significance value of 0.028. This indicates that there is a significant difference between the experimental class and the control class. Based on the decision rule of the Mann Whitney test, which states that if the significance value is less than 0.05, then H_o is rejected and H_a is accepted. Therefore, it can be concluded that there is a significant difference resulting from the use of the developed media namely, the test instrument assisted by the Bamboozle web-based learning media.

Conclusion

Based on the results and discussion presented, this research employed the Research and Development (R&D) method using the ADDIE model, which includes the stages of Analysis, Design, Development, Implementation, and Evaluation. At the Analysis stage, activities included curriculum analysis, learning material analysis, and learning media analysis. The Design stage involved planning the learning materials, creating test instruments, developing teaching modules, and designing the Bamboozle web-based media for the IPAS subject on *Cultural Heritage*. The Development stage focused on creating the Bamboozle-assisted learning media and test instruments, followed by material and test validation, after which revisions were made based on expert feedback and suggestions. The Implementation stage involved applying the developed learning media in the classroom, using the Bamboozle-assisted test instrument for the experimental class and PowerPoint-based media for the control class. The final stage, Evaluation, consisted of formative evaluation, which gathered feedback from validators, and summative evaluation, conducted through pretest and posttest results as well as a practicality test of the developed product.

The Bamboozle-assisted educational game learning media developed in this study demonstrated good feasibility as a learning medium for the IPAS subject. The results showed an average validation score of 100% from test experts and 79.2% from media experts, both indicating that the product is feasible for use. Furthermore, the use of the Bamboozle-assisted test instrument significantly improved the critical thinking skills of fifth-grade students at *MI Darul Maarif 1 Serut*, with a significance value of 0.028. This indicates a statistically significant difference between the experimental and control classes, as the significance value was lower than the threshold of $\alpha = 0.05$.Therefore, the null hypothesis (H_o)—which states that there is no difference between the experimental and control classes—is rejected, and the alternative hypothesis (H_1) which states that there is a difference in students' critical thinking skills between the two groupsis accepted.In conclusion, the findings indicate that there is a significant difference in

students' critical thinking skills resulting from the use of the developed test instrument assisted by the Bamboozle educational game media.

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